

GEMINI PICTORIAL

Gemini orbital space flight operations with two-man crews began March 23, 1965. Supported by a worldwide net of communications stations and fleet recovery forces, these operations are managed from the National Aeronautics and Space Administration's Mission Control Center at Houston, Texas.

Hundreds of man-hours of space flight with mission durations up to 14 days have included experience in rendezvous, docking, manned performance outside the spacecraft, and other operations. The manned operations program has provided an orderly progression of operational capabilities from the 2,900-pound Mercury spacecraft to the 7,000-pound Gemini. This soon will be extended to the 95,000-pound Apollo Lunar Module system. Apollo operations with three-man crews beginning in 1967 will significantly extend the Mercury and Gemini experience. By the time NASA astronauts undertake the first manned landing on the moon, the Gemini and Apollo programs will have provided thousands of man-hours of flight time.

The Mercury spacecraft, launched by the Atlas, provided this country's first capability for manned earth-orbital flight and was used in the three-orbit mission by John Glenn in February 1962.

The Gemini two-man spacecraft, in combination with Titan II launch vehicles, have made missions of up to 14 days in earth-orbit possible. These missions include orbit change, maneuvers, spacecraft rendezvous and docking techniques and also permit the astronauts to venture outside the spacecraft into free space for extravehicular activities.

The Gemini program also provides NASA scientists and engineers a flexible, experimental space tool with which to flight-test space equipment, conduct scientific experiments, perfect flight techniques, and provide crew training for Project Apollo.

The Gemini spacecraft consists of two major elements, the reentry module and the adapter, with a combined weight of 7,000 pounds. The reentry module provides life support and control equipment for the two crewmen, contains most of the experiments as well as the rendezvous and recovery systems. The adapter module provides the link between the Titan II launch vehicle and the reentry module. It is composed of two sections: An equipment section to provide augmented life support, stabilization equipment and expendables for flight durations of up to 14 days, and a retrograde section to slow the spacecraft from its orbital velocity.

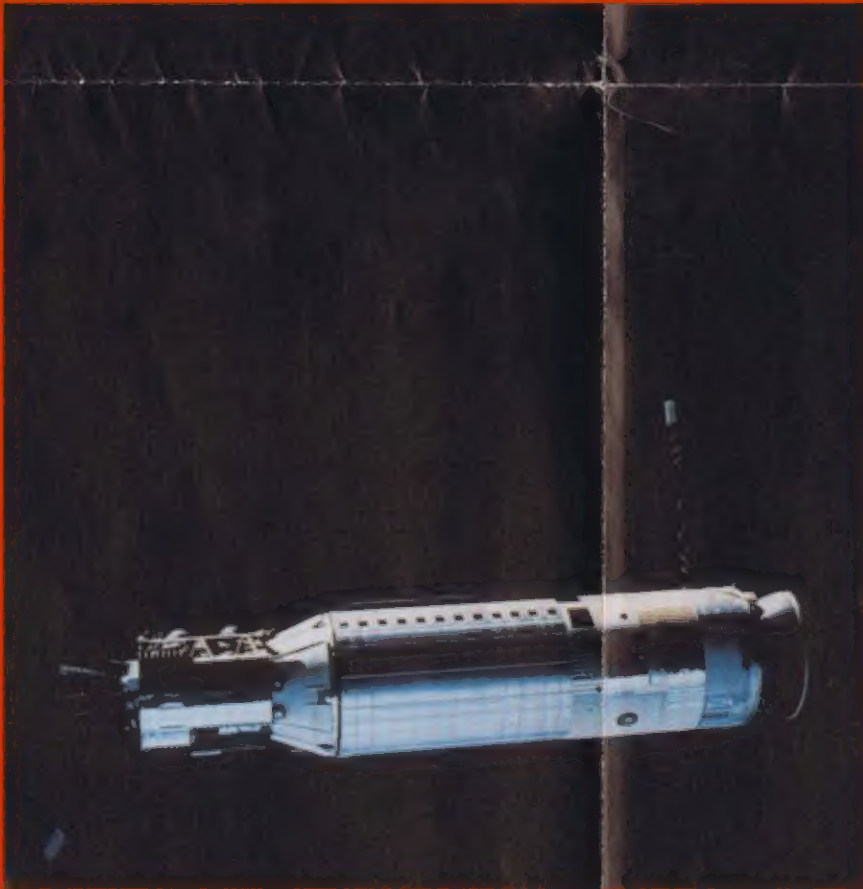
Several of the Gemini missions are designated primarily as rendezvous missions. These missions explore various modes of accomplishing rendezvous utilizing different levels of automation in the sensing and control equipment.

In a typical mission, an Agena is launched into an approximate 160-nautical-mile circular orbit. The manned Gemini spacecraft is then placed into a lower circular orbit at approximately 130 nautical miles. The different periods of the two spacecraft in these concentric orbits cause a continuing change in the relative position of the Gemini with respect to the Agena. When the relative positions are proper, the Gemini spacecraft is accelerated by its crew into a transfer ellipse to the higher orbit where rendezvous and docking are accomplished. These missions are short lived because the weight requirement for fuel reduces the expendables that can be carried for life support, power supply, and stabilization.

On the Gemini long-duration missions, primary emphasis is placed on biomedical and behavioral aspects of crewmen under weightless conditions. At the same time, however, scientific and technical experiments are conducted on all missions. Specific experiments range all the way from visual definition experiments requiring no equipment and astronomical observations made with a 2-pound ultraviolet camera to astronaut maneuvering experiments using equipment weighing as much as 200 pounds.

The experiment program is tailored to the available weight, volume, and power in the spacecraft on each mission as well as to the participation and accessibility which can be provided for the astronauts. The volume available for experiments within the pressurized cabin is limited, but extravehicular operations conducted by the astronauts permit free-space experiments such as the testing of manual dexterity and the use of specialized tools for spacecraft repair functions.

The United States has invested nearly \$1.4 billion in development of the Gemini program. This has included the modification of the Titan II missile to adapt it for use as the Gemini launch vehicle, and the design, fabrication, test, and proof of operational capability of the Gemini spacecraft, including the ability to rendezvous with separately launched Agena target vehicles. The investment also includes use of this combination over a period of several years to practice maneuvers in near-earth orbit and to perform various experiments that are important for future manned space flights to the moon and beyond.



1. Gemini VI Astronauts Walter M. Schirra, Jr. (in front), command pilot, and Thomas P. Stafford, pilot, leave the suiting trailer on their way to pad 19 during a prelaunch countdown. Gemini VI was successfully launched on December 15, 1965. Leaving the trailer behind the two astronauts is Astronaut Alan B. Shepard, Jr., first American to ride into space.
2. Gemini VII, carrying Astronauts Frank Borman, command pilot, and James Lovell, Jr., pilot, was successfully launched by the NASA's John F. Kennedy Space Center December 4, 1965. The Gemini and its crew circled earth 206 times in 230 hours and 35 minutes. The Gemini VII launch served as a target vehicle for Gemini VI rendezvous exercises. Gemini VI with Astronauts Walter M. Schirra, Jr., command pilot, and Thomas P. Stafford, pilot, was launched December 15, 1965, to rendezvous with Gemini VII.
3. Aden Protectorate, with the Wadi Hadhramaut and Hadhramaut Plateau, looking southward, as seen from the Gemini VII spacecraft. Body of water is the Gulf of Aden. This picture was taken during the spacecraft's 130th revolution of the earth.
4. Ras Hafun, coast of Somali Republic, northeast Africa, as seen from the Gemini VI spacecraft during its 13th revolution of the earth.
5. Cap Blanc and Levrier Bay on the coast of Spanish Sahara and Mauritania, as seen from the Gemini VI spacecraft during its 15th revolution of the earth.
6. Andros, New Providence, and Barry Islands in the Bahama Islands as seen from the Gemini VII spacecraft during its 15th revolution of the earth.
7. The eastern Mediterranean area as seen from the Gemini VII spacecraft. The Nile Delta in Egypt is at bottom. The Suez Canal, Gulf of Suez, and Red Sea are in center of photograph. Sinai Peninsula is in upper right corner of picture. Body of water at top edge of photograph is Gulf of Aqaba. The Dead Sea can be seen in top center of picture. Israel, Palestine, Jordan, and Syria are also at top center. The island of Cyprus is at extreme left.
8. This view of the orbiting Gemini VII spacecraft was taken from the Gemini VI spacecraft during their historic rendezvous mission in space. The two spacecraft were approximately 29 feet apart when this picture was made. Aboard the Gemini VI were Astronauts Walter M. Schirra, Jr., and Thomas P. Stafford. Astronauts Frank Borman and James A. Lovell, Jr., were in the Gemini VII spacecraft.
9. Agena turned 45° toward Gemini VIII; sea clouds, limb of earth, sky in background. The picture was taken by Astronaut David Scott in Gemini VIII at a distance of 210 feet.
10. Side view of entire Agena taken by Astronaut David Scott from Gemini VIII, at a distance of 44 feet. The picture was taken as Gemini VIII approached west coast of Mexico.
11. The Agena Target Docking Vehicle seen from the Gemini VIII spacecraft during the latter's approach for rendezvous and station (formation) keeping. Astronaut David Scott took this picture at an approximate distance of 2 feet.
12. Gemini VIII spacecraft is docked with the Agena target vehicle. This picture was taken from the right-hand seat by Astronaut David Scott. The Gemini VIII mission was terminated during the sixth orbit due to an electrical short circuit in a yaw thruster.
13. This unusual color photograph shows the Gemini VIII spacecraft docked with the Agena target vehicle. The picture was taken from the right-hand seat by Astronaut David Scott. Camera buffs will be interested to know that the camera used in this photo (and for all other space photos on these pages) was a Hasselblad with Kodak Ektachrome S.O. 217 color film.
14. Astronaut Edward H. White II is shown performing his spectacular space feat during the third orbit of the Gemini IV flight. He became the first American Astronaut to leave his spacecraft while in orbit. He remained outside the spacecraft for 21 minutes.
15. Astronaut White floats into space, secured to the Gemini IV spacecraft by a 25-foot umbilical line and a 23-foot tether line, both wrapped together with gold tape to form one cord. For his 21-minute space walk, White wears a space suit specially designed for extravehicular activity.
16. Astronaut Edward White, floating in space during the third orbit of the Gemini IV flight, seems to be bathing with his spacecraft tether. Actually, he is just moving away from Gemini IV moments after stepping outside.
17. Astronaut White, floating in space, secured to the Gemini IV spacecraft by the 23-foot tether line, is holding Hand-Held Self-Maneuvering Unit which he used to move about in the weightless environment.
18. This photo of Astronaut White provides viewers an especially good look at his space suit, emergency oxygen supply chest pack, and the Hand-Held Self-Maneuvering Unit.
19. Closeup view of Astronaut White performing his spectacular space feat during the third orbit of the Gemini IV flight. White and the Gemini IV command pilot, Astronaut James A. McDivitt, performed other scientific and engineering experiments before completing their 62-revolution mission.
20. Astronauts Walter M. Schirra, Jr. (back to camera), command pilot, and Thomas P. Stafford (on left), pilot, open their Gemini VI spacecraft hatches while awaiting the arrival of the aircraft carrier U.S.S. Wasp. A three-man U.S. Navy frogman team assisted in the recovery operations. The two astronauts remained inside the spacecraft until it was hoisted aboard the carrier. Gemini VI splashed down about 12 miles from the carrier to conclude a highly successful 25-hour, 52-minute mission in space.